

SOMATIC HYBRIDIZATION BETWEEN PUCCINIA GRAMINIS VAR. TRITICI AND PUCCINIA GRAMINIS VAR. SECALIS.

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Synopsis.

Somatic hybrids between *Puccinia graminis* var. *tritici* and *P. graminis* var. *secalis* have been obtained under glasshouse conditions. Their pathogenic properties combine those of their parental strains. It is suggested that somatic hybridization between the two varieties of *P. graminis* may play a role in the origin of new strains of wheat stem rust in the field.

It has now been well established that when certain selected cultures of *Puccinia graminis* Pers. var. *tritici* (Eriks. and E. Henn.) are mixed in the uredial stage on plants of the appropriate graminaceous host, hybridization will readily occur (Watson, 1957; Watson and Luig, 1958). It has been shown that under Australian field conditions certain pathogenic strains of *P. graminis* var. *tritici* could have arisen as somatic hybrids between previously existing strains (Watson & Luig, 1958). Since *P. graminis* var. *secalis* is widespread throughout Tasmania and was found from widely separated areas of the eastern Wheat Belt of Australia in 1958, the possibility of somatic hybrids occurring between this organism and *P. graminis* var. *tritici* has been studied. It is well known (Stakman *et al.*, 1930) that these two varieties of *P. graminis* will hybridize sexually on the barberry.

TABLE 1.

Reaction Types of Twelve Wheat Varieties, Rye and Agropyron repens to Parental Strains of *P. graminis* and Two Hybrids between Them.

| Variety. | Parents. | | Hybrids. | |
|----------------------------|--|--|-----------------|-----------------|
| | Red <i>P. graminis</i> var. <i>secalis</i> 57241. | Orange <i>P. graminis</i> var. <i>tritici</i> NR 2. | M9-a. | M10-a. |
| Little Club | :1, 2- | 4 | 3 ^c | 3 ^{c+} |
| Marquis | ; | 3+ | :2= | x, 2++ |
| Reliance | 0 | 3+ | 0 | 0 |
| Kota | 0; | 3 | 0; | 0; |
| Arnautka | 0; | 0; | 0; | 0; |
| Kubanka | 0; | X | 0; | 0; |
| Acme | 0; | 0; | 0; | 0; |
| Einkorn | :1- | 3+ | 3- ^c | 3- |
| Vernal | ; | 3+ | :1+ | 3 |
| Khapli | 0; | ; | 0; | 0; |
| Yalta (Sr 11, Sr 12) | ; | 3+ | 3 | :1,2= |
| Morocco W1103 .. | :1 | 3+ | :1 | 3+ |
| Black Winter Rye .. | 1+, 2, 3+ | :1= | 1, 2, 3+ | 1, 2, 3+ |
| <i>Agropyron repens</i> .. | 2 | 0; | 0; | 0; |

Using single spore cultures of red *P. graminis* var. *secalis* (accession number 57241; from Gosford, N.S.W.) and orange NR-2 (Watson, 1957) and adopting the same crossing procedures as previously outlined (Watson, 1957), two different somatic hybrids were obtained from several mixtures. The reactions of these hybrids on varieties of Table 1 which have been stable over several generations are clearly distinguished from those of any existing Australian strain of *P. graminis*. M9-a, for

example, which attacks Yalta is avirulent on Morocco, usually a very susceptible variety. Emmer is susceptible to M10-a, but Kota resistant, and we have not previously found that combination in any one strain. Moreover, both strains, although they do not produce a very susceptible reaction on Black Winter Rye, are more virulent on rye than are the parental strain NR-2 and other strains of *P. graminis* var. *tritici*. *Agropyron repens*, which is susceptible to *P. graminis* var. *secalis*, is resistant to both strains M9-a and M10-a and Little Club is not fully susceptible to either. Hence the two hybrids may be considered more or less intermediate in their parasitic properties between those of their parental varieties of *P. graminis*.

DISCUSSION.

There is considerable significance in these results from the point of view of breeding for stem rust resistance. Since from this cross a hybrid was derived having virulence on Vernal Emmer there seems no reason why such intervarietal crosses would not produce hybrids capable of rendering ineffective other genes now used as sources of rust resistance. In this regard *P. graminis* var. *secalis* must be considered as an avirulent strain of *P. graminis* var. *tritici*.

Literature Cited.

- STAKMAN, E. C., LEVINE, M. N., and COTTER, R. N., 1930.—Origin of physiologic forms of *Puccinia graminis* through hybridization and mutation. *Scientific Agriculture*, 10: 707-720.
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